# BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

## IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.**

1973

# PATENT SPECIFICATION (11) 1 332 235

DRAWINGS ATTACHED

(19)

1 332 235

(21) Application No. 2339/71 (22) Filed 18 Jan. 1971

(23) Complete Specification filed 30 Dec. 1971

(44) Complete Specification published 3 Oct. 1973

(51) International Classification B65G 15/64

(52) Index at acceptance

B8A 1G2



(72) Inventor WILLIAM MICHAEL FOXWELL

## (54) CONVEYOR TRACKING ARRANGEMENT

(71) We, DANIEL FOXWELL & SON LIMITED, a British Company, of Cumberland Works, Cheadle, Cheshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns a conveyor tracking arrangement, that is to say an arrangement associated with an endless conveyor belt or band (hereinafter referred to generally as "belt" for convenience) and adapted, upon the belt wandering from its desired path of movement, to act upon the belt to return it to its correct path.

In relation, for example, to moving textile webs, it is already known to provide a web guiding arrangement which comprises, at each side of the web, a pair of guide rollers which provide a nip through which a respective edge portion of the web passes, these roller pairs each being disposed at an angle to the desired path of movement of the web, with the pair at the one side oppositely angled to that at the other side, and normally being loaded together to grip with the web. Each such roller pair also has a respective sensor which senses the respective edge of the web and serves, upon deviation of the web edge, to engage and/or displace such sensor, the latter then acting to relax the loading together of the rollers of the respective pair of rollers.

Accordingly, with such known arrangements, upon normal movement of the web properly along the desired path, neither sensor is engaged and/or displaced, and both pairs of guide rollers grip with and are rotated by engagement with the respective edge portions of the web. Since each roller pair is at an angle to the desired direction of movement of the web, the effect of each such pair is such as to tend to cause the web to deviate to the respective side. However, the action of each pair of guide rollers, during such normal web movement, is to cancel out the web-deviating action of the other pair of guide rollers thereby to maintain such normal web movement and to ensure that the web is progressed in a transversely-taut condition.

Upon the web deviating to one side of its desired path, the sensor of the guide roller pair at said one side is engaged and/or displaced. As a result the grip of the corresponding guide roller pair is relaxed, leaving only the other pair of guide rollers gripping its edge of the web and therefore tending to restore the web to its intended path. As soon as normal movement of the web is restored, both guide roller pairs grip their respective web edge portions once again to maintain such normal movement.

Such an arrangement is satisfactory for textile applications where, usually, the web will be progressed through the guiding arrangement only once, and usually it is an advantage to be progressed in a transversely-taut condition. It is not satisfactory, however, for use as a conveyor tracking arrangement wherein an endless belt is involved, since the belt's edge portions pass continuously and repeatedly between the respective guide roller pairs and are substantially continuously gripped, squeezed and tensioned thereby. As a result, the belt's edge portions become reduced in thickness and laterally stretched, so that the entire configuration of the belt becomes deformed and unsatisfactory running and/or conveyance may result. Further, in the case of conveyor belts or bands of comparatively abrasive materials or construction (e.g. wire or wire mesh conveyor bands) the surfaces of the guide rollers rapidly become damaged, and the guide rollers have to be repaired and/or replaced at frequent intervals.

An object of this invention is to provide an arrangement wherein the above-discussed

[Price 25p]

disadvantages are substantially eliminated or minimised.

With this object in view, the present invention provides a conveyor tracking arrangement comprising two pairs of guide rollers disposed one at each side of an endless conveyor belt at an angle to the path of movement of said belt to provide respective nips for the respective edge portions of the belt to pass therethrough but not normally gripping said edge portions, and, for each edge of the belt, a respective sensor for detecting deviation of the belt from a desired path of movement, each said sensor being adapted, upon deviation of the belt towards the respective side, to cause the pair of guide rollers at the opposite side of the belt to grip its respective edge portion of the belt to apply corrective constraint to the belt and, upon restoration of said belt to its desired path, to cause separation of said pair of guide rollers at said opposite side, wherein each said pair of guide rollers has associated therewith a respective pneumatic device which, upon supply of compressed air thereto, serves to urge a movable roller of the pair towards the other roller of the pair and each sensor is associated with a respective valve which serves to control the supply of compressed air to the pneumatic device of the opposed pair of guide rollers.

Each said pneumatic device may comprise a diaphragm which is deformed, upon supply of compressed air to the device, to displace a plunger movement of which urges the movable roller towards the other said roller.

In order that the invention may be fully understood, it will be described further, by way of example, with reference to the accompanying drawings which illustrate a preferred embodiment thereof, it being understood that the following description is illustrative, and not limitative, of the scope of the invention.

In the drawings:—

Fig. 1 is an end elevation, looking along the line of movement of the endless band, of the preferred embodiment of the conveyor tracking arrangement of the invention;

Fig. 2 is a fragmentary plan taken as indicated by the arrow II in Fig. 1; and

Fig. 3 is a fragmentary side elevation, to an enlarged scale, taken as indicated by the arrow III in Fig. 1.

The illustrated preferred embodiment of the conveyor tracking arrangement of the invention, as applied to an endless conveyor belt (e.g. in a factory), is associated with a lower run 11 of the belt and comprises a pair of supporting crossbars 12 extending parallel to one another transversely of said run 11 of the belt, beneath the latter. These crossbars 12 serve to support, one to each side of the belt, two conveyor tracking units indicated generally by the reference numerals 13 and 14 respectively. Since these units 13 and 14 are substantially identical it is only necessary, of course, to describe one of them, (for instance the unit 14 shown in Fig. 2) in detail.

Such tracking unit 14 comprises a slide 15 mounted on the crossbars 12 so as to be adjustable in position therealong, grub screws (not visible), set into the slide 15, enabling the latter to be clamped in its adjusted position. Supported by the slide 15 is an upright or pillar 16, this being secured in position by a bolt 17 extending upwards through the slide 15 and engaging into the pillar 16, so that the angular orientation of the pillar 16 on the slide 15 can be selected as desired, and once such orientation has been selected the pillar 16 can be made fast on the slide 15. At its upper end, the pillar 16 is formed as a widened flat plate 18 with which an upwardly-directed apertured lug 19 is formed integrally. This lug 19, whose aperture is substantially vertically above the axis of rotation of the pillar 16 about its bolt 17 which secures it to the slide 15, serves for securement to the pillar 16, with its axis substantially horizontal, of an upper guide roller 20 of the tracking unit. This roller 20, which is freely rotatable, is a metal smooth-surfaced roller, and is disposed just above the run 11 of the belt.

Disposed substantially vertically below the upper guide roller 20, and just below the lower run 11 of the belt, is a lower resiliently-surfaced guide roller 21. This roller 21 is rotatably mounted in a U-shaped yoke or stirrup 22 by which the lower guide roller 21 can be raised to engage the belt at the respective edge portion, thereby gripping said edge portion between itself and the upper guide roller 20. The yoke or stirrup 22 is swingably supported, by arms 60, from a pivot bolt 61 projecting from the plate 18.

Secured to the pillar 16, by a bolt 23 therethrough vertically below the upper and lower guide rollers 20 and 21, is a cantilever arm 24 which extends horizontally beneath the lower guide roller 21 and has, at its free end, a socket 25 whose axis is vertical, this socket 25 being positioned below the stirrup or yoke 22 of the lower guide roller 21 about mid-way along the length of the base of the U thereof. This cantilever arm 24 serves to support a pneumatic device 26 (see also Fig. 3) beneath the pair of guide rollers constituted by the upper and lower guide rollers 20 and 21. This pneumatic device 26 comprises a lower disc-like body part 27 onto which is screwed an upper closure cap 28 having a substantially central externally-threaded tubular spigot 29 projecting vertically upwards therefrom, this spigot 29 extending through the socket 25

in the cantilever arm 24 and being secured in place by a nut 30 engaged onto the spigot 29, which accordingly, mounts the pneumatic device 26 on the cantilever arm 24. Located between the body part 27 and the closure cap 28, by its outer periphery being clamped therebetween, is a flexible or deformable diaphragm 31 (Fig. 3) having secured centrally thereof an upwardly-directed plunger 32 which extends through the spigot 29 and engages by its upper end with a thrust piece 62 provided approximately midway along the base of the U of the stirrup or yoke 22. It will thus be understood that upward extension of the plunger 32 serves to raise the stirrup or yoke 22 and therefore to cause gripping, between the pair of guide rollers, 20 and 21, of the belt's edge portion, whilst downward movement of the plunger 32 permits separating movement of the lower guide roller 21 relative to the upper guide roller 20, thereby to ensure that the belt's edge portion is not gripped.

An operating air inlet union 33 is provided on the body part 27 of the pneumatic device 26, and this opens to the space between said body part 27 and the diaphragm 31, to provide a connection between said space and a respective flexible air supply tube 34 which is connected to the other pneumatic device 26 as will be described later.

Provided on the underside of the lower body part 27 of the pneumatic device 26 is a valve mechanism. This comprises a pair of aligned seating blocks 35 and 36 formed integrally with and protruding from said body part 27 and having aligned air passages 37 and 38 therethrough. These two blocks 35, 36, at their adjacent ends, are formed with respective integral downwardly-projecting lugs 39 and 40, and are ground on the confronting faces. Accommodated in the gap between the two blocks 35 and 36 is a movable valve plate 41 which is secured onto a pivot rod 42 which is journalled in the downwardly-projecting lugs 39, 40. This valve plate 41 has ground opposed faces sealingly engaging with the ground faces of the seating blocks 35 and 36 and has therethrough a valve opening 43 enabling the passages 37 and 38 through the blocks 35 and 36 to communicate with one another when the opening 43 is in register therewith. This valve plate also has, in one of its faces, a groove (not visible) which, when registering with the passage 38, opens said passage 38 to atmosphere. The passage 37 has in its outer end, a releasable valve inlet union 44 whereby a flexible tube 45 from a compressed air source (not shown) is connected thereto. The passage 38, which is the one with which the groove in the valve plate 41 can register, is closed with a plug 46 at its outer end, but has a lateral passage provided with a respective valve outlet union 47 by which the respective flexible tube 34 extending to the other pneumatic device 26 is connected.

It will be appreciated that the two pneumatic devices 26 are both connected to the compressor air source by their valve inlet unions 44. With each said device, the valve outlet union 47 thereof is connected, by its flexible tube 34, to the operating air inlet union 33 of the other pneumatic device 26, so that when the valve of the one pneumatic device 26 permits the passing of the compressed air, such air passes to the other said pneumatic device 26 to deform its diaphragm 33, extend its plunger 32, and raise the corresponding lower guide roller 21.

In each of the pneumatic devices 26, the pivot rod 42 of the valve plate 41 has secured thereto a boss 48 on the lower end of a sensor arm 49 which projects upwards through a respective slotted guide 63 to extend adjacent the respective pillar 16 and which is disposed so as to be just in contact with the respective edge of the conveyor belt's run 11. A substantially horizontal arm 50 connected to the boss 48 has a balance weight 51 adjustably secured thereto, to enable the engagement of the sensor arm 49 with the respective edge of the belt to be adjusted so as to be extremely light.

The operation of the described arrangement will readily be appreciated from the foregoing. With the belt run moving in the direction of the arrow 52 in Fig. 2, along its proper path, the positions in which the valve plates 41 are held by the sensor arms 49 are such that the space beneath each diaphragm 31 is opened to atmosphere by way of the respective tube 34 leading to the passage 38 of the other pneumatic device, where such passage 38 is connected, by the groove in the respective valve plate 41 to atmosphere. Incoming air supplied to the passages 37 by way of the inlet unions 44 and tubes 45 in each case encounters a blank portion of the face of the respective valve plate 41, so that the passages 38 are cut off from the incoming air. Accordingly, the lower guide rollers 21 of the two tracking units 13, 14 remain in their lowered dispositions and no constraint is applied to the belt run 11 thereby.

If, however, the belt run 11 should deviate to one side of its proper path, it deflects the corresponding sensor arm 49 to cause pivotal movement of the corresponding pivot rod 42 and the respective valve plate 41 thereon. This has the result of permitting compressed air to pass to the space beneath the diaphragm 31 of the other tracking unit, so that its plunger 32 is extended upwards to cause the edge portion of the belt run 11 (at the side thereof opposite to the side to which the belt run 11 has wandered) to be gripped

between the two guide rollers 20 and 21 of such other tracking unit. As a result, this tracking unit applies a correcting constraint to the belt run 11, to draw it back to its proper path, whereupon the air is cut off by the sensor arm 49 of the other unit returning to its normal position, and the tracking units are restored to their original conditions. Naturally, such operations are repeated as necessary with each deviation of the belt run 11, and serve to ensure that such belt run 11 follows its correct path continuously.

The invention is not confined to the precise details of the foregoing example and variations may be made thereto. Thus, the arrangement could, if desired, be such that the upper guide roller 20 of each tracking unit is held raised from the belt run 11 during normal running of the latter, such upper roller 20 being lowered to cause gripping of the belt run 11 when necessary to apply correcting constraint thereto.

In the described arrangement, the valves are formed as integral components of the tracking units. This, of course, is not necessary, and such valves together with their respective sensors, could be independently arranged components.

Other variations are possible. For example, instead of the metal smooth-surfaced rollers, resiliently-surfaced rollers can be used.

## WHAT WE CLAIM IS:—

1. A conveyor tracking arrangement comprising two pairs of guide rollers disposed one at each side of an endless conveyor belt at an angle to the path of movement of said belt to provide respective nips for the respective edge portions of the belt to pass therethrough but not normally gripping said edge portions, and, for each edge of the belt, a respective sensor for detecting deviation of the belt from a desired path of movement, each said sensor being adapted, upon deviation of the belt towards the respective side, to cause the pair of guide rollers at the opposite side of the belt to grip its respective edge portion of the belt to apply corrective constraint to the belt and, upon restoration of said belt to its desired path, to cause separation of said pair of guide rollers at said opposite side, wherein each said pair of guide rollers has associated therewith a respective pneumatic device which, upon supply of compressed air thereto, serves to urge a movable roller of the pair towards the other roller of the pair, and each sensor is associated with a respective valve which serves to control the supply of compressed air to the pneumatic device of the opposed pair of guide rollers.

2. A conveyor tracking arrangement as claimed in claim 1 wherein each said pneumatic device comprises a diaphragm which is deformed, upon supply of compressed air to the device, to displace a plunger movement of which urges the movable roller towards the other said roller.

3. A conveyor tracking arrangement as claimed in claim 2 wherein each movable roller is mounted in a respective yoke engaged by the upper end of the respective plunger.

4. A conveyor tracking arrangement substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

For the Applicant(s)

BARLOW GILLET & PERCIVAL,
Chartered Patent Agents,

94 Market Street, Manchester, 1.
and
20 Tooks Court, Cursitor Street,
London, E.C.4.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1973.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

198/~~202~~ 840

1973

1332235 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

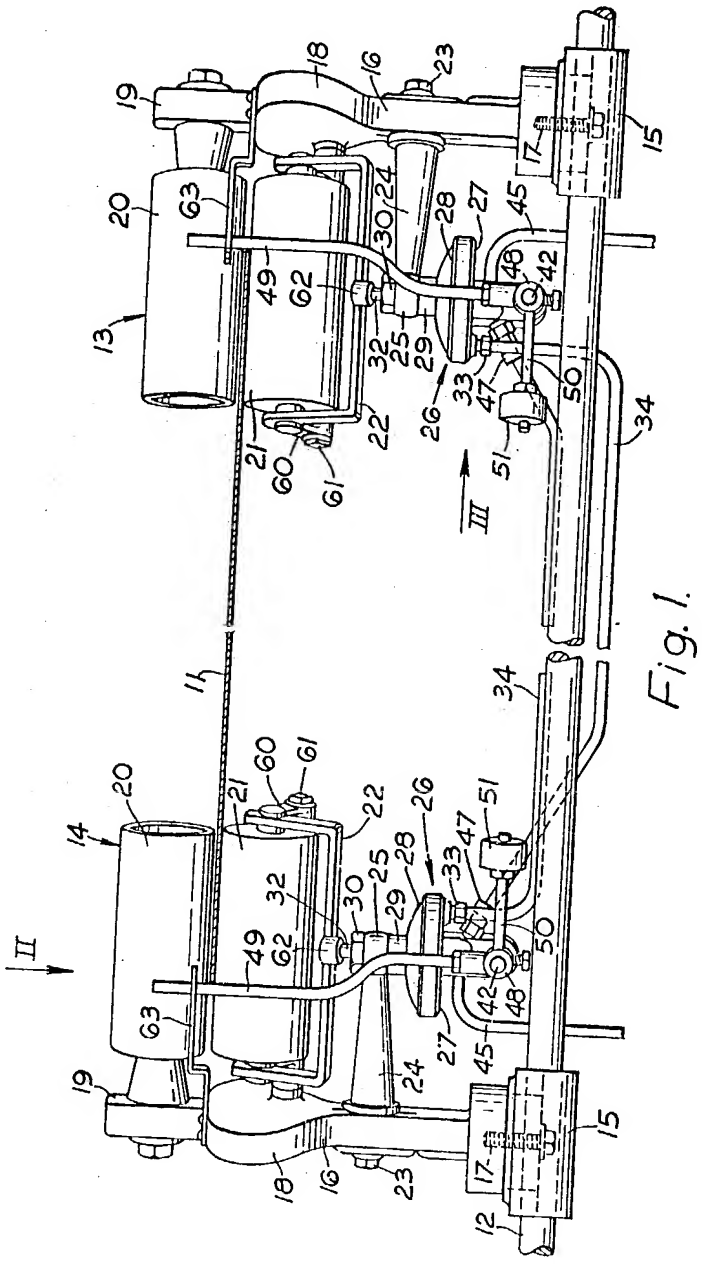

Fig. 1.

1332235 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 2

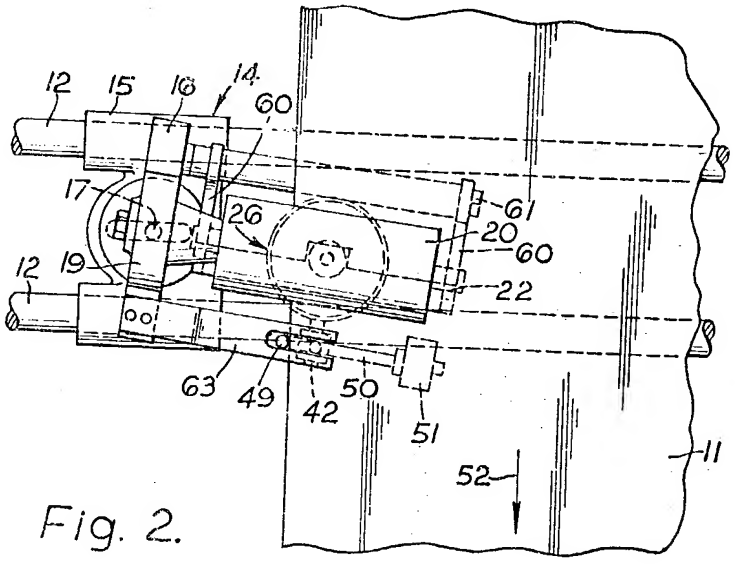


Fig. 2.

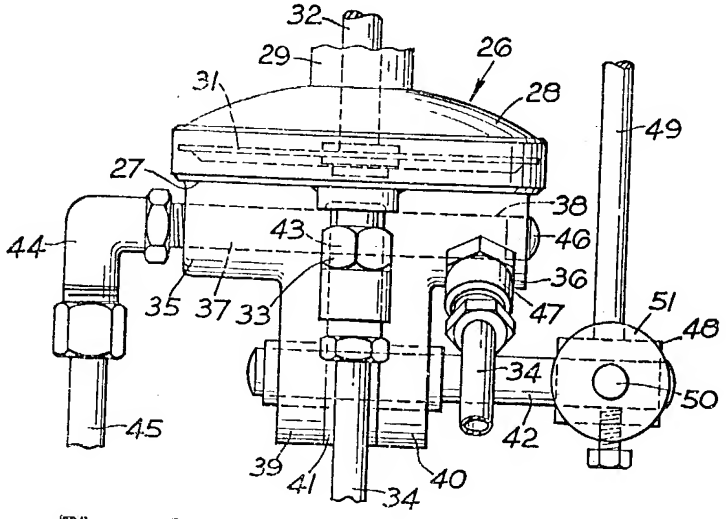


Fig. 3.